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IS 7016-3 (1981): Methods of Test for Coated and Treated Fabrics, Part III: Determination of Tear Strength [PCD 13: Rubber and Rubber Products]



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IS : 7016 (Part III) - 1981

(Reaffirmed 2003)

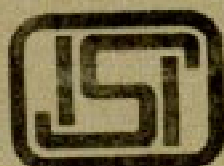
Indian Standard

METHODS OF TEST FOR COATED AND TREATED FABRICS

PART III DETERMINATION OF TEAR STRENGTH

(First Revision)

UDC 677·865·064 : 677·017·424·28



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Indian Standard

METHODS OF TEST FOR COATED AND TREATED FABRICS

PART III DETERMINATION OF TEAR STRENGTH

(First Revision)

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Indian Standard

METHODS OF TEST FOR COATED AND TREATED FABRICS

PART III DETERMINATION OF TEAR STRENGTH

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Part III) (First Revision) was adopted by the Indian Standards Institution on 25 November 1981, after the draft finalized by the Treated Fabrics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

0.2 This standard was first published in 1973 and has been revised mainly to align it with ISO 4674-1977 ' Fabrics coated with rubber or plastics — Determination of tear resistance ', issued by the International Organization for Standardization.

0.3 This standard is designed to determine the tear strength of fabrics coated with rubber or plastics.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part III) prescribes three methods for the determination of the tear resistance of fabrics coated with rubber or plastics. The methods, A1, A2, and B, do not give the same results.

*Rules for rounding off numerical values (revised).

IS : 7016 (Part III) - 1981

1.1.1 The methods are applicable to coated fabrics in which the constituents of the backing fabric perpendicular to the direction of tearing are broken; they are not applicable to fabrics with cellular backing or a meshed cloth backing in which the tear pattern is complex, and are only of limited value for coated fabrics employing knitted-base fabrics.

2. TERMINOLOGY

2.1 For the purpose of this standard, definitions given in IS : 2244-1972* shall apply.

3. PRINCIPLE

3.1 In methods A1 and A2, force is applied to extend steadily a cut in the test piece. In method B, a sudden force is applied to the test piece with a cut in it.

4. SAMPLING

4.1 The samples shall be cut in such a way as to be as representative as possible of the whole piece being examined. The test pieces shall be selected in such a way that their edges are situated at a minimum distance of 0.10 m from the longitudinal edge; they shall not be taken from less than 1 m from the ends of the piece.

4.1.1 For the test for tearing in the transverse direction (that is tearing longitudinal threads), the test pieces shall be selected so that their width is parallel to the longitudinal edge of the coated fabric.

4.1.2 For the test for tearing in the longitudinal direction (that is tearing transverse threads), the test pieces shall be selected so that their width is perpendicular to the longitudinal edge of the coated fabric.

5. NUMBER OF TEST PIECES

5.1 For each series of tests, 10 test pieces shall be selected, 5 in the longitudinal direction and 5 in the transverse direction of the sample piece.

The same thread of cloth in the direction to be tested shall not appear in more than one test piece.

6. TIME LAPSE BETWEEN MANUFACTURE AND TESTING

6.1 For all test purposes, the minimum time between manufacture and testing shall be 16 hours, in order to ensure that the material attains dimensional stability due to stress relaxation.

6.2 In order to bind the user and supplier to a stipulated time for carrying out conformity test for supplied material, the following shall apply.

*Glossary of terms relating to treated fabrics (*first revision*).

6.2.1 For non-product test, separate test pieces are required for testing. Therefore, the maximum time between manufacture and testing shall be 6 weeks and for the evaluation to be comparable the tests, as far as possible, shall be carried out after the same time interval.

6.2.2 For product test, whenever possible, the time between manufacture and testing shall not exceed 6 months. In other cases, tests shall be made within 4 months of the date of the receipt of the product by the customer.

7. CONDITIONING OF TEST PIECES

7.1 The test pieces shall be conditioned immediately before testing for a minimum of 48 hours at $27 \pm 2^\circ\text{C}$ and 65 ± 5 percent relative humidity.

7.2 If it is required to determine the properties of wet material, the test pieces shall be immersed in distilled water containing 1 percent (v/v) ethanol for 24 hours at $27 \pm 2^\circ\text{C}$. The test pieces shall be cut prior to this immersion. Immediately after removal of the test pieces from water, they shall be blotted between two sheets of absorbent paper and tested at once.

8. TEST METHODS

8.1 Method A — Constant Rate of Tear

8.1.1 The test machine shall be power-driven and shall be equipped with a suitable dynamometer. It shall be capable of maintaining, during the test, a substantially constant rate of traverse within the range 1.7 ± 0.17 mm/s or 5.0 ± 0.2 mm/s and of recording the force autographically. An inertialess dynamometer (for example of electronic or optical type) shall preferably be used.

NOTE — Pendulum type inertia dynamometers may in fact give different results because of the effects of friction and inertia. When the use of an inertia dynamometer is unavoidable, information may be obtained on the tear resistance in the following way: the capacity of the machine, or the measuring scale selected when a variable-range machine is involved shall be such that the separation force reading is between 15 and 85 percent of the rated capacity.

8.1.1.1 The accuracy of the machine shall be such that the error in the force measurement as shown and recorded shall not exceed 2 percent of the force or 0.4 percent of the maximum of the scale, whichever is the smaller. The jaws of the machine shall be wider than the test piece and, in any case, not less than 75 mm wide.

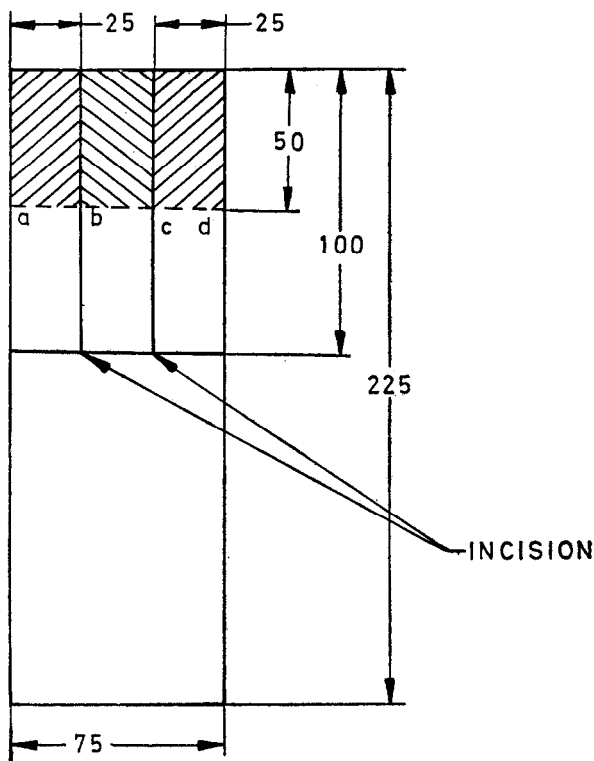
8.1.1.2 All edges that might cause a cutting action shall be rounded to a radius of not more than 0.4 mm. The pressure between the gripping surfaces, sufficient to clamp the test piece firmly before the testing load is applied and to prevent slippage during the progress of the test, shall be attained by means of any suitably constructed mechanical device operating on the movable member of the clamp.

8.1.2 Method A1 — Test Using Three-Tongued Test Piece — Double Tear

8.1.2.1 Test piece — The test piece (see Fig. 1) shall be rectangular, 225 mm long by 75 mm wide. Two longitudinal slits 100 mm in length shall be made in it to form 3 tongues, 25 ± 0.5 mm wide.

8.1.2.2 Procedure — Adjust the test machine to give the required rate of jaw traverse and select an appropriate load capacity range. Engage and zero the autographic recorder. Place the middle tongue of the test piece in the fixed jaw so that the line *bc* (see Fig. 1) is just visible. Maintain the distance between the two tongues at 25 mm. Set up test pieces with the respective axes of the backing fabric parallel and perpendicular to the direction of application of force.

Start the test machine at the specified rate of traverse and continue the tearing until the test piece is completely torn.



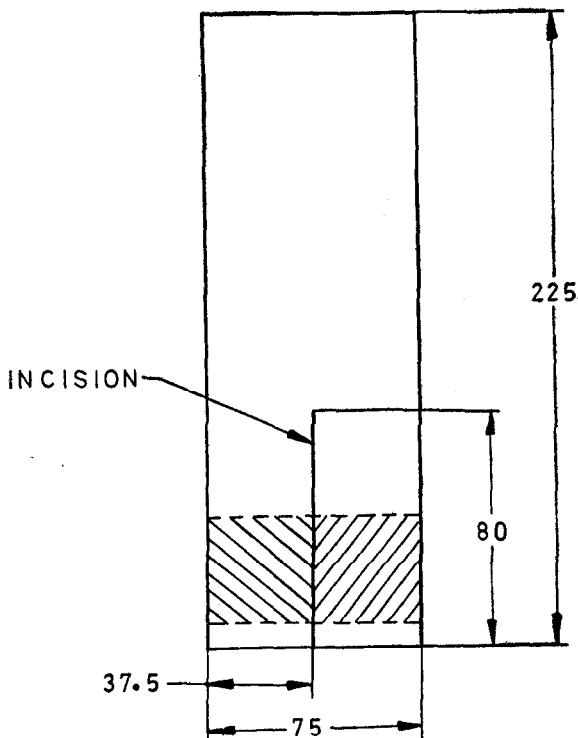
All dimensions in millimetres.

FIG. 1 THREE-TONGUED TEST PIECE

8.1.2.3 Expression of results — From the trace obtained on the recorder, determine the median of the 5 highest forces on the central 50 percent. Report the result as the median value for 5 test pieces.

8.1.3 Method A2 — Test Using Trouser-Shaped Test Piece — Single Tear

8.1.3.1 Test piece — The test piece (see Fig. 2) shall be a rectangular strip 225 mm long by 75 ± 0.5 mm wide. A longitudinal slit, 80 mm in length, shall be made in it beginning from the middle of the width.



All dimensions in millimetres.

FIG. 2 TROUSER-SHAPED TEST PIECE

8.1.3.2 Procedure — Adjust the test machine to give the required rate of jaw traverse and select an appropriate load capacity range. Engage and zero the autographic recorder. Place the test piece symmetrically in the jaws, with one tongue in each of the jaws and the uncut end of the test piece remaining free. Take care to ensure that each tongue is fixed in a jaw, so

that the beginning of the tear is parallel to the direction in which the tearing force is applied.

Start the test machine at the specified rate of traverse and continue the tearing until the test piece is completely torn.

8.1.3.3 Expression of results — From the trace obtained on the recorder, determine the median of the 5 highest forces on the central 50 percent. Report the result as the median value for 5 test pieces.

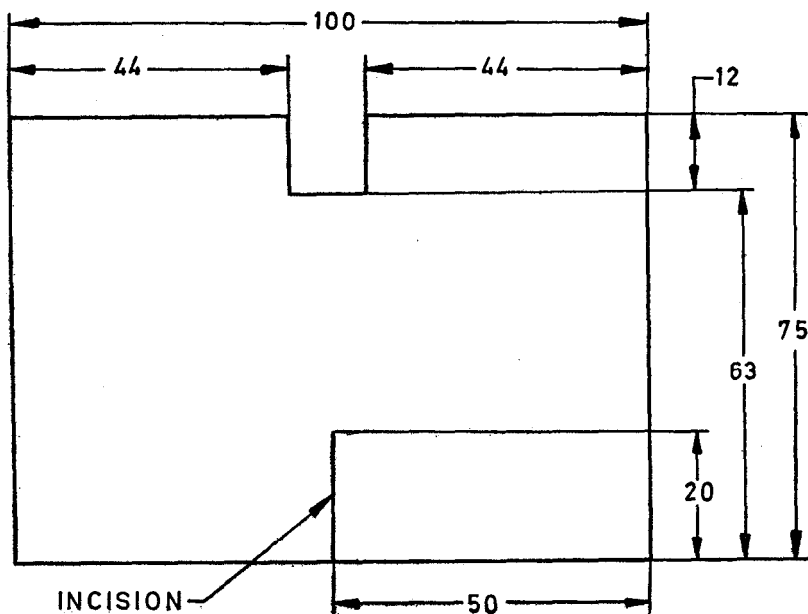
8.2 Method B — Tear Falling Pendulum

8.2.1 Apparatus — The test machine is of the pendulum type — in which the test piece is held between two jaws, one movable and the other fixed. The clamping faces of the jaws shall be in the same plane when the apparatus is in its starting position. The moving jaws are attached to a pendulum which can fall under the influence of gravity.

The apparatus is made up of the following parts:

- a) A pendulum comprising a circumferential graduated scale to indicate the energy used to tear the test piece. The test apparatus shall be provided with several interchangeable scales so that the tearing energy is between 15 and 85 percent of the scale maximum. This pendulum may swing freely about a horizontal axis on roller bearings.
- b) A movable jaw solid with the pendulum and a fixed jaw solid with the framework. These jaws shall be 2.5 mm apart in order to just permit the passage of the knife. When the pendulum is in its starting position, the clamping faces of the jaws shall be in the same plane perpendicular to the plane of swing of the pendulum. The force of the jaws and the surface state of the clamping faces shall permit the test piece to be held without slipping.
- c) A sector release to hold the pendulum in a raised position during the mounting of the test piece and to release the pendulum to tear the test piece.
- d) A pointer, driven by the pendulum, and a pointer stop to record the maximum arc of the swing of the pendulum.
- e) A knife to begin the tear of the test piece by cutting a slit in it exactly half-way between the two jaws.

8.2.2 Test Piece — The test piece (see Fig. 3) shall be a rectangle, 100 mm long and 75 ± 0.5 mm wide. In one of the 100 mm sides, there shall be a notch 12 ± 0.5 mm square.



Tolerances on dimensions = ± 0.5

All dimensions in millimetres.

FIG. 3 NOTCHED TEST PIECE

8.2.3 Procedure — Level the apparatus in a horizontal position. Adjust the pointer so that when the apparatus is operated without a test piece it stops at zero. Repeat this operation several times. Set the pendulum to bring the two jaws to the same alignment. Put the pointer in the starting position. Clamp the test piece in the jaws, so that the long side of the test piece is parallel to the line of the upper edges of the jaws. Using the knife [see 8.2.1 (e)], make an incision 20 ± 0.5 mm in the centre of the side opposite the 12 mm square notch. Free the pendulum. When the test piece has been torn, read the scale.

NOTE — The accuracy of the test depends on the length of the material which is not cut.

8.2.4 Expression of Results — For each series of test pieces, determine the median of the 5 energy values obtained in the longitudinal direction and in the transverse direction respectively.

9. TEST REPORT

The test report shall include the following particulars:

- a) The test method used (that is, A1, A2 or B) and the rate of traverse (method A1 or A2);
- b) The individual results obtained on each of the 10 test pieces; and
- c) The median values in the longitudinal and transverse directions.

(Continued from page 2)

Panel for Physical Methods of Test for Treated Fabrics, PCDC 16 : 6 : 1

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INDIAN STANDARDS

ON

TREATED FABRICS

IS :

- 1001-1956 Fuel pump diaphragm fabrics: (a) synthetic rubber proofed, (b) varnish proofed
- 1259-1977 Vinyl coated fabrics (*second revision*)
- 1421-1964 Cellulose nitrate coated fabrics (*revised*)
- 2037-1962 Tracing cloth
- 2089-1977 Common proofed canvas/duck and paulins (tarpaulins) (*second revision*)
- 2244-1972 Glossary of terms relating to treated fabrics (*first revision*)
- 2789-1972 Special proofed paulins (tarpaulins) (*first revision*)
- 3322-1965 PVC-coated fabrics for foul weather clothing
- 3768-1966 PVC-ventilation tubing (flexible ducting)
- 4355-1977 Fire-resistant brattice cloth (*first revision*)
- 4501-1967 Aprons, rubberized, acid and alkali resistant
- 4810-1968 Fumigation sheets and covers, rubberized
- 5915-1970 Single texture rubberized waterproof fabrics
- 6110-1971 Double-texture rubberized fabrics
- 6803-1972 Special proofed canvas and duck
- 7016 Methods of test for treated fabrics
 - 7016 (Part I)-1973 Determination of roll characteristics
 - 7016 (Part II)-1973 Determination of breaking strength and extension at break
 - 7016 (Part III)-1981 Determination of tear strength (*first revision*)
 - 7016 (Part IV)-1973 Determination of resistance to damage by flexing
 - 7016 (Part V)-1973 Determination of coating adhesion
 - 7016 (Part VI)-1973 Determination of bursting strength
 - 7016 (Part VII)-1973 Determination of water proofness
 - 7016 (Part VIII)-1975 Accelerated ageing
- 8698-1977 Expanded vinyl coated fabrics
- 8699-1977 PVC coated fabrics for footwear industry

AMENDMENT NO. 1 SEPTEMBER 1990
TO
IS 7016 (Part 3) : 1981 METHODS OF TEST
FOR COATED AND TREATED FABRICS
PART 3 DETERMINATION OF TEAR STRENGTH

(First Revision)

(Page 6, clause 8.1.2.1) — Insert the following in the end:

‘NOTE — In case of coated fabrics of high tear strength, if the tongue breaks or threads are pulled from the fabric instead of being broken, wider specimens, 200 mm x 150 mm, shall be used with the tongue 50 mm wide.’

(PCD 16)

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